

## 'An Advancing Hurricane'

$$\text{a) model city as } (x - 240)^2 + (y - 200)^2 = 2500 \quad (1)$$

$$\text{severe damage if: } (x - 240)^2 + (kx - 180)^2 = 2500 \quad (1)$$

$$\text{thus, } (k^2 + 1)x^2 + (-480 - 360k)x + 87500 = 0 \quad (1)$$

Idea that no damage is done if this quadratic has no real roots thus, (1)

$$(-480 - 360k)^2 - 350000(k^2 + 1) < 0 \quad (1)$$

$$551k^2 - 864k + 299 > 0 \quad (1)$$

$$\text{if } 551k^2 - 864k + 299 = 0, k = \frac{432 \pm 25\sqrt{35}}{551} \quad (1)$$

$$\text{thus values of } k \text{ satisfying inequality are } k < \frac{432 - 25\sqrt{35}}{551} \text{ or } k > \frac{432 + 25\sqrt{35}}{551} \quad (1)$$

b) A suitable example such as, it doesn't consider the curvature of the earth, or it only accounts for a hurricane moving in a perfectly straight line. (1)